REVISIONS

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TOLERANCES

DECIMAL
.XX = N/A
.XXX = N/A

TITLE

OPERATING MANUAL, DIODE DRIVER MODEL 766A

ANGULAR
X = N/A

SCALE	SIZE	FSCM	SHEET	DRAWING NUMBER	REV.
N / A	A	61651	1 OF 17	21-026	A

Contents

Table of Figures

1 Overview

The 766A laser diode driver is a medium power, short pulse, diode driver. It is designed to be driven by two digital signals. Two additional optional signals can be provided to achieve small scale remote electrical control of the driver. It has a single status output which is compatible with most logic devices.

1.1 Description

The driver has 6 basic subsystems. Refer to figure 1.

1. The high voltage power supply.
2. The high voltage pulse generator.
3. The pulse shaping circuits.
4. The enabling system.
5. The triggering system.
6. The TEC controller system.

1.1.1 The High Voltage Power Supply

The high voltage power supply is a standard switching topology, adjustable supply. It is adjustable from 30 to 154 V. The supply has been developed to have exceptionally low over and undershoot due to step load changes. The supply can provide up to 10 W output power. The power supply output is controlled by the enable signal. Its start-up is staggered with the TEC Controller to reduce inrush current during power on.

1.1.2 The High Voltage Pulse Generator

The high voltage pulse generator consists of two power FETs, a charge storage capacitor, and associated driving circuits. The output is a pulse of around 120 ns FWHM and approx. 90% of the high voltage power supply setting. This is in the form of a capacitive discharge with most of the energy in the leading edge. The circuit discharges the cap and then recharges it once per trigger event. A bleed resistor maintains the charge when the circuit is not being triggered enabling pulse on demand operation.

1.1.3 Pulse Shaping Circuits

The pulse shaping circuits are a proprietary system of active and passive components designed to handle the following functions:

1. Optimize the source impedance of the driver as seen by the laser diode.
2. Speed up and narrow the pulse from the high voltage pulse generator.
3. Attenuate the ring current to prevent voltage reversal across the intrinsic laser diode. Voltage reversal does occur across the laser diode package parasitics.

4. Prevent the occurrence of a second, third, etc. follow on pulses.

1.1.4 The Enabling System

The Enabling system normalizes the Enable input. It provides two principal operating functions:

1. Implement the Boolean function: Enable_out = Enable_in AND NOT(Temperature Fault).
2. Level shift the signals to perform their functions.

Its output enables/inhibits both the driver and the high voltage power supply.

1.1.5 The Triggering System

This subsystem establishes the input impedance and normalizes the trigger pulse. The trigger takes place on the rising edge of the trigger pulse. A mono-stable produces the correct width of pulse to initiate system functions on both the leading and trailing edges. The trailing edge initiates capacitor charging in preparation for the next pulse.

1.1.6 The TEC Controller System

The TEC controller is a proprietary PID controller with dual polarity output. It is capable of supplying up to 4 V and ±2.5 A of current. There is an over and under temperature flag with a window of approximately 0.5°C. This flag is to signal the temperature fault output. When faulted, the driver will be internally inhibited as will the HV power supply. When a temperature fault is generated by the TEC controller, it will self-clear as soon as the laser temperature is within the error window.

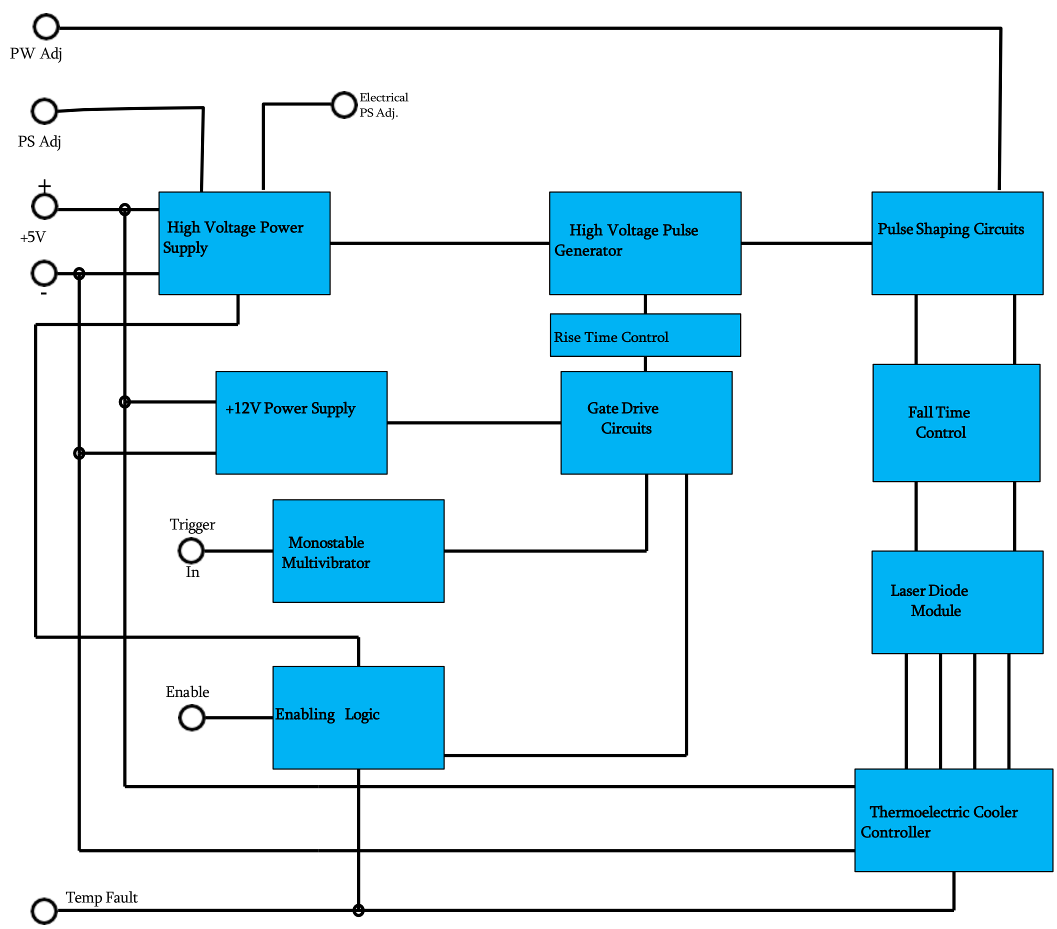

Figure 1 Block Diagram

2 Handling

2.1 During Storage, Packaging, etc.

2.1.1 General

1. The driver is a Static sensitive electronic assembly. All normal anti-static precautions apply.
2. When packaging for shipment, without a laser, the back side of the PCB may lie in contact with the packaging material.
3. When packaging for shipment with a laser is attached, the packaging material should be kept away from the laser on both sides of the board. The fiber should be stabilized separately next to the board by taping to a carrier of foam or cardboard and securing that so that it can't move.

2.2 Safety

2.2.1 Personal Safety

Observe proper laser source safety restrictions. We are not responsible for any failure of the customer to observe safety precautions. These drivers produce only nanojoules of energy in each pulse. However, the accumulated power of many pulses can produce eye or skin damage especially as we have no control over the wavelength of the laser used, or any light amplifying equipment to which it may be connected.

When working with fibered lasers, make sure to keep any fiber pieces or trimmings policed up. Dispose of them safely. These can be very dangerous if they pierce the skin, are inhaled, or ingested.

When operating, the driver can have up to 160 VDC on some components. **DO NOT TOUCH THE DRIVER WHILE IT IS OPERATING. DISABLE AND WAIT AT LEAST 2 SECONDS FOR THE HIGH VOLTAGE TO BLEED DOWN BEFORE TOUCHING THE UNIT.**

2.2.2 Driver and Laser Safety

Many components in the driver operate at intermittent voltages near breakdown. **DO NOT PROBE THE DRIVER WITH AN OSCILLOSCOPE OR METER. THE CHANGE IN LOAD CAUSED BY THE CAPACITANCE AND INDUCTANCE OF THE PROBES WILL CAUSE A CHANGE IN OPERATING CHARACTERISTICS, AND CAN CAUSE DAMAGE TO THE LASER OR THE DRIVER.**

The exception to this is the temperature set test points which can be probed at any time the TEC is disabled and TP1. Touching the TEC test points with tools or probes when the TEC is operating will alter the operating temperature. It would return to normal operating after removing the connections.

The driver and laser diode are static sensitive devices. Observe static precautions at all times.

Avoid applying force to the PCB when mounted with the laser. Board flex in the laser cutout can create sufficient force on the laser package leads to damage the laser, or the pads to which it is soldered.

2.3 Mounting the Driver

Note: See Section on laser mounting to determine whether a mounting plate or heat sink should be used. If so, the following section on site selection applies to the host, but the mounting instructions apply to the plate or heat sink. In any case, the laser must be mechanically attached to the driver PCB by a structure in addition to the leads. It is also effective, when using a mounting plate, to substitute longer screws (not supplied) for the PCB mounting screws, tap the mounting plate through, and then use nuts and washers on the protruding ends to join the assembly to the host. A thermal sink for the laser is not required if the TEC will not be used.

2.3.1 Site Selection

If convection cooling is to be used, the most favored position is vertical. The driver should be mounted at least 1/4" away from corners and surfaces to allow free air circulation to the back side of the PCB.

If fan cooling is to be used, the air should be ducted or baffled to flow both over the top and behind the PCB, or the unit and fan location should be chosen to allow this to occur naturally.

2.3.2 EMI

The generation of picosecond switching times on high voltages inevitably leads to production of EMI. Consideration of this should be given in selecting a mounting position. Mounting near low voltage logic such as a gate array, or µP may cause erratic operation. Fast analog circuitry can also be affected. The following items should be considered when the driver is to be used in an OEM capacity:

1. Application of shielding or compartmentalization.
2. Use of grounded cases of other items such as power supplies, to shield the driver from the sensitive circuitry.
3. Mounting the driver so that the back of the PCB faces the sensitive circuitry.
4. Mounting the driver in a shared shielded area with other EMI producing items.

2.3.3 Materials Required

The following materials will be needed to mount the driver assembly:

1. The Driver
2. 4ea #4-40 X .375" machine screws. If metric hardware is desired M3 hardware is satisfactory.
3. 4ea Washers for above
4. 4ea #4 X .250" spacers.
5. Thread locking compound Loctite 222 or equivalent.

2.3.4 Procedure

Note: If long screws are being used, it is better to put the Loctite on the screws just below the standoff length.

1. Place a drop of Loctite in each mounting hole.
2. Place the mounting screws with washers into two of the holes at the same end of the board, not

diagonal. Slip the spacers onto the screws. Align with their appropriate mounting holes. Screw in only 2 turns.

3. Insert the other screw/washer assemblies into the remaining mounting holes. Add the spacers as the screws are being inserted.
4. Tighten all the screws only to the point where the board can be repositioned easily.

2.4 Mounting the Laser

2.4.1 General

Although the 766 series of drivers was designed for a standard 14-pin butterfly laser package, the newer 10-pin butterfly can be accommodated. Some special problems accompany its use.

1. The distance from the laser mounting surface to the solder surface of the leads is only .08” (2mm). As the PCB thickness is approx. .062” (1.5mm), the remaining .018” (.5mm) is insufficient for proper circulation of cooling air to the reverse side of the board. This is the primary cooling surface handling 65% of the driver heat, and 85% of the TEC controller heat. This could result in premature failure of the device under some, normally acceptable, operating conditions. Two solutions will be given, there are others. Mount the laser to a pedestal tall enough to create .25” (6.35mm) minimum space under the board and mount the board with appropriate spacers. Mount the laser directly to the mounting surface and fill the space under the board with Gap Pad or similar thermally conductive material. Care must be taken with this last approach to avoid excess board warpage from Gap Pad compression pressure. The mounting surface must be sufficiently thermally conductive to carry the heat to a place where the air flow can remove it.
2. The 10-pin butterfly package is much narrower than the 14-pin. This can make it difficult to cut the pins freehand with enough accuracy to allow simultaneous alignment of the pads on the board and the holes on the mounting surface. We recommend the use of a fixture to hold the laser with guides for the cutting operation. The longer narrower pins will increase the driving inductance causing some loss of speed.

   To maximally reduce the stress on the laser leads, which must be kept short, the laser leads should be soldered after both the laser and the driver are bolted into their final positions.

   If the mounting site is satisfactory, but using a separate mounting plate is not desirable, an assembly fixture can be used to preassemble the laser to the board. Such a fixture must not only assure that the mounting holes will be sufficiently well aligned to result in no twisting or stretching of the assembly when mounted in the host, but also that the vertical location of the laser relative to the board will be within .001” (.025mm) of its position when mounted in the host. Otherwise, the assembly will not be reliable in use. Because of the longer leads, the 10-pin package can have .005” (.125mm) tolerance.

The laser diode case must not be grounded. The capacitance to ground should not exceed 3 pf. If these conditions are not met additional ringing and possibly multiple pulses may be generated. A resistor is included in the circuit to damp the package parasitics. AC or DC grounding of the package will bypass the resistor.

2.4.2 Trimming the Leads

Trim all leads such that the overall width is .76” (19.3mm). Be sure to cut square to lead and center the laser body. Shearing type cutters produce better results than pinch off cutters.

2.4.3 Mounting

The laser diode must be heat sunk for the TEC to maintain the diode operating temperature. The power contributed by the pulse action is significant at high rep rates, and as the efficiency of thermoelectric cooling decreases rapidly when the hot side temperature is increased, the maximum rise in the heat sink must be limited to 20˚C to allow operation at +50˚C ambient. The preceding assumes a laser diode operating temperature of +25˚C. The figures would need to be adjusted for other operating temperatures either diode, or ambient. Thermoelectric heating is 100% efficient, so that in situations where the laser would be always heated, no heat sink would be required.

If, for any reason, laser diode temperature control is not used, no heat sink would be needed.
When heat sinking, assuming a metal mounting surface, thermal interface material must be used between the laser package and the mounting surface. A relatively thick insulator should be used to limit the capacitance to ground. Either non-conductive screws, or an insulating insert will be needed to isolate the mounting hardware.

2.4.4 Materials Required

1. The laser diode with trimmed leads.
2. Thermal pads should be used.
3. 4ea #2-56 X .187” machine screws. If metric hardware is desired M2 or M2.5 may be used.
4. 4ea Washers for above.
5. Thread locking compound Loctite 222 or equivalent.

2.4.5 Procedure

1. Apply thermal pad to the mounting surface.
2. Place a drop of thread locking compound in each threaded laser mounting hole.
3. Assemble a washer on one of the screws. Place through a laser diode hole. Insert the laser/screw assembly through the cutout in the driver PCB observing the direction of the fiber cutout. Thread screw into the mounting hole just sufficient to retain laser.
4. Assemble the other three (2) screw/washer pairs. Insert and loosely thread.
5. Align laser leads with board pads by moving both the laser and the board.
6. Tighten all laser diode mounting screws to the specifications of the laser/thermal material manufacturer.
7. Move the driver PCB around, if necessary, to obtain exact alignment between the laser diode leads and the PCB pad pattern.
8. Tighten the board retaining screws to 3 in-oz.

9. Carefully examine the distance between the bottom of the leads and the PCB pads. If greater than .003” (estimate is OK), with a suitable tool press down on the extreme tip of the lead to reduce the gap. Do not attempt to make the lead lie flat on the pad. A broken laser can result. It is sufficient for the tip of the lead be close to the pad.

2.4.6 Soldering

Solder the pins to the corresponding exposed pads with a solder alloy compliant to the RoHS specification. During soldering DO NOT apply any pressure to the board, or the laser leads. The joints must solidify stress free.

3 Electrical Specifications and Requirements

3.1 Interface

Pin	Signal
1	Enable Input
2	Ground
3	Temperature Fault
4	Ground
5	Power Supply Adjust
6	Ground
7	Pulse Width Adjust
8	Ground

Table 1 I/O Connector Pin Out

3.1.1 Connectors

The power is connected via 1 Molex 3.5mm pitch 2-pin terminal block, see Fig. 2 for polarity assignment.

The trigger signal is connected through a single right angle MMCX coaxial socket. A matching cable is supplied with the driver.

The balance of the input and output signals are connected via 1ea 8-pin TE Connectivity MicroMatch Connector P/N 188275-8. A matching cable is supplied with the driver.

3.1.2 Signals on the I/O Connector

3.1.3 The Trigger Signal

The trigger input impedance is 2k DC coupled, 50 Ohms AC coupled.

1. The input pulse Zero level must be below 1.42 V.
2. The input pulse One level must be greater than 3.68 V.

3. The minimum pulse width for triggering is 10 ns.
4. The maximum pulse width is 0.8 times the pulse spacing.
5. The minimum trigger spacing is 1 µS.
6. There is no maximum trigger spacing.

Withing the listed rules, pulse timing can be totally arbitrary. One output pulse will be produced for each trigger pulse rising edge.

There are no specific requirements for the pulse rise and fall times. The fall time is inconsequential. The optical pulse timing jitter will improve with reducing rise time of the trigger pulse down to approximately 1 ns.

From 0 to 100 kHz there is little change in optical amplitude and a small change in width. From 100 kHz to 1 MHz, the pulse width will narrow, and the amplitude fall. If you will be operating at high rep rates, it is recommended that you set the high rate, and then adjust the pulse to suit.

3.1.4 Input Power

The driver is designed to operate from a DC current source of +5 V ±0.25 V at 3.2 A maximum current. It is recommended that the power source ripple be less than 100 mV at full current.

The TEC controller and the high voltage power supply both have significant inrush current, the TEC controller at power up, and the high voltage supply at the time of enabling. Should the source voltage dip too far neither circuit will start properly. It is recommended that a wire gage of #20 is a minimum should be used to connect the power if the runs are short (<4”). For longer runs up to #16 gauge may be used limited by the maximum wire size the terminal block will accept.

3.1.5 Enable Input

This is a TTL voltage level compatible active low input. The input will tolerate -0.5 V to 5.5 V. The input impedance is 4.75k to +5 V. The input can also be driver by open or short to ground, 5 V CMOS, 3.3 V CMOS, open collector or drain transistor. When this signal is HIGH the laser and the high voltage power supply will be disabled. When LOW, the power supply and the driver circuits will be enabled. If this input is left open it will default HIGH (Disabled).

If operating from 3.3 V CMOS, a 6.8k resistor should be connected from the input to ground to prevent the high level from exceeding the 3.3 V rail.

3.1.6 Temperature Fault

This is an active low, open drain output with 4.75k pull-up resistance. The output will be high during normal operation. It will be pulled low if the laser is greater than ≈.5˚C high or low of the set point. When low, the driver will be internally disabled, until the temperature stabilizes in the window. Use of this signal is discretionary. It is capable of driving TTL, 3.3 and 5 V CMOS, sensitive relays, transistors, FETs, and LEDs. If the signal is used to drive 3.3 V CMOS, a 6.8K resistor to ground should be added to prevent over voltage on the CMOS input. The maximum sink load should be limited to 25 mA.

3.1.7 Power Supply Adjust

This signal is an analog input signal which allows setting the high voltage power supply output with an electrical input. To use the input, the power supply adjustment pot must not be set at maximum output. The input impedance of the signal is approximately equal to the pot resistance (rheostat mode), at max output setting pot resistance is 0 Ω. Turning the pot a couple turns CW will yield a comfortable input impedance.

The voltage range is 0 to .7 V. Zero gives maximum output; .7 V gives the minimum output. The voltage source must be capable of sinking and sourcing current.

3.1.8 Pulse Width Adjust

This is an analog input enabling electrical adjustment of the optical pulse width. To use the input, the pulse width adjustment pot must not be set at minimum pulse width. The input impedance of the signal is approximately equal to the pot resistance. Measure the voltage on the pulse width adjust pin with nothing connected. Adjust the pot for at least 1 V before connecting the input. The input voltage range is 0 to 6 V. This gives minimum to maximum pulse width respectively. It should be noted that 0 Volts will not normally produce a detectable pulse. This control cannot produce the full range of pulse width available with manual adjustment. The widest pulses require setting the rise time control to be set to max CW, while the narrowest pulses require max CCW. The variations between various laser types do not permit a less generalized description.

3.1.9 Ground

The grounds in the signal connector should be used to reference all analog signals.

3.2 Controls

3.2.1 High Voltage Adjustment Pot

The high voltage adjustment pot is set to maximum high voltage (approx. 154V) at the factory and will not need changing unless the use of the electrical control 3.1.7 is desired.

3.2.2 Pulse Width Adjustment Pot

This adjustment is set to minimum pulse width at the factory. Adjust this pot as desired to set the pulse width.

3.2.3 Rise Time Adjustment Pot

This pot alters the rise time of the high voltage pulse generator. Counter-clockwise (faster rise time) will create shorter pulses at higher peak powers. CW adjustment (slower rise time) will generate lower peak power wider pulses. In the case of second pulses which some lasers create, increasing the rise time will often remove the second pulse. This generally happens at intermediate pulse widths. This pot is set to fully counter-clockwise at shipment.

3.2.4 Laser Temperature Adjustment Pot

The laser temperature pot may be adjusted between -5 and +60˚C. See temperature set instructions in 4.5.

3.2.5 TEC Disable Switch

In some situations, it may be desirable to operate the laser without benefit of temperature stabilization. Additionally, there are some devices which do not have a thermoelectric cooler in the package. In either of these situations the TEC controller must be turned off . There is a small switch on the driver for this purpose. See Figure 2.

3.2.6 Fall Time Adjustment Pot

This adjustment is a variable capacitor. Some lasers produce a relatively long tail on the falling side. This is caused by excessive package parasitics. The effect can be reduced at the expense of output power by adjusting this control. As it also reduces output power, it can be used as an amplitude control. It is factory preset for maximum output power.

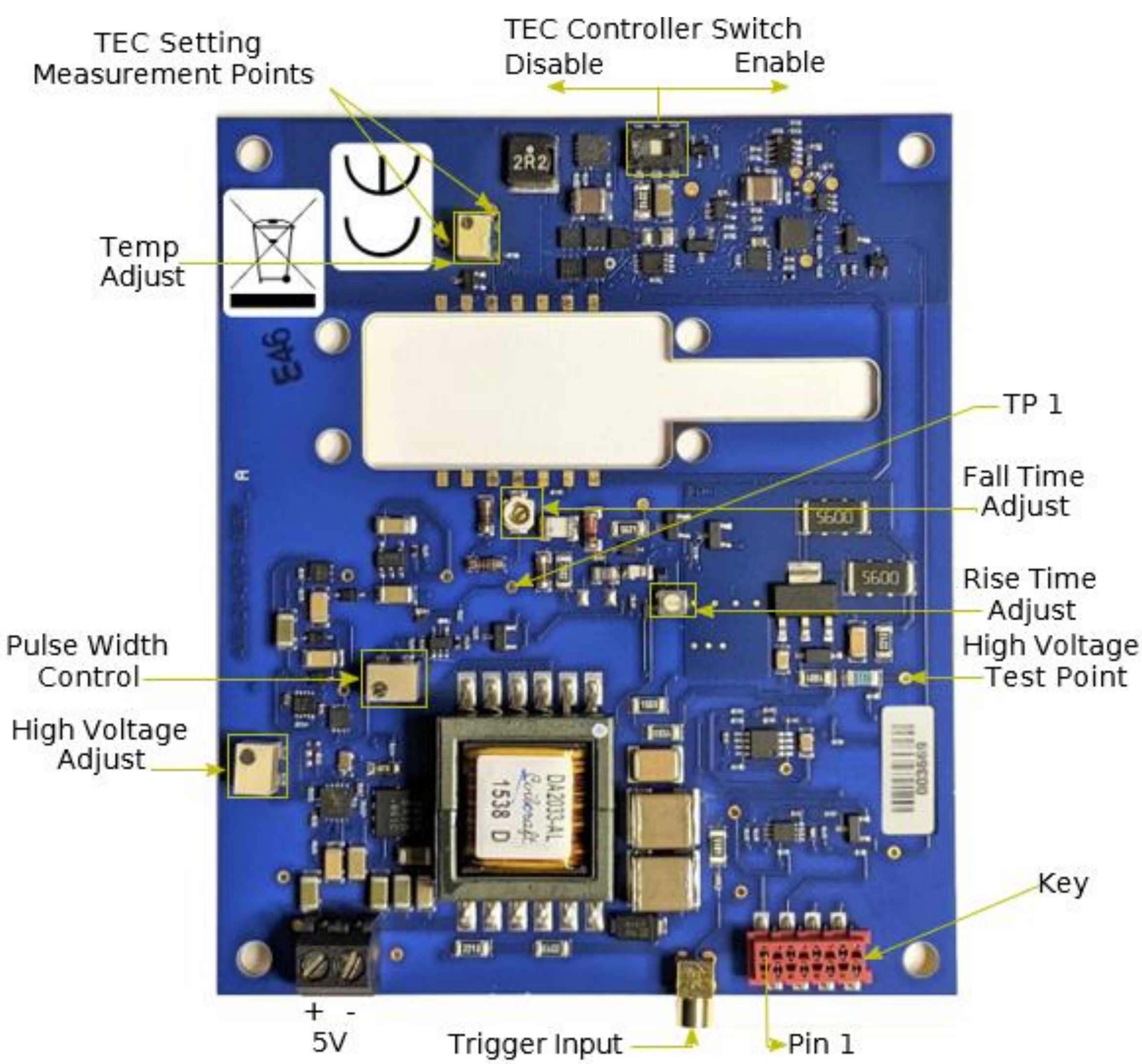

Figure 2 Printed Circuit Board Identification

4 Using the Driver

Safety precautions:

Note: For any adjustments which are made with the high voltage applied to the circuit (On and Enabled), please heed the following precautions:

- Use a commercial or fabricated plastic bodied adjustment tool. A ceramic or plastic tip is best, but metal can be used. If the bare metal is longer than 1/8" (3mm), cover the balance with tubing, tape, or other insulating material. If the tool has a metal clip, it is recommended to remove it.
- Be mindful to avoid accidental contact with the high voltage while the operator's attention is focused elsewhere.
- Evaluate the safety of the location with the above in mind. In addition, examine any additional hazards which the operator must avoid. Rearrange the workstation, if necessary to remove sources of distraction. If any part of the body will (or can) be in contact with ground, insulate the hands and arms with safety gloves. A single point contact with the high voltage is unpleasant. Connecting the operator across the high voltage and ground can be damaging.
- Train the operator that if anything unusual happens, such as dropping the adjustment tool, to disable the driver, or turn off power and wait 2 seconds before trying to retrieve the tool or correct for the event.

4.1 Power On

As there is only a single supply, there is no power up sequence for this driver. It is recommended that the Enable input be kept open or HIGH and Trigger inputs be kept LOW at turn on. Allow a full second for the on-board power supplies to start up and stabilize before commanding action. The high voltage supply is initialized but disabled at power on.

4.2 Enable

Set the Enable input to LOW state. The driver will require 50 ms to become fully operational after the Enable signal falls. During this time the high voltage supply charges the energy storage capacitor for the first time. There are no restrictions on Trigger state. However, if triggered during the high voltage power supply rise time, the pulses generated will be runt or missing. The driver can be enabled at any time.

4.3 Disable

Raise or open circuit the Enable input to disable. The driver will require 2 seconds to completely disable. During this time the high voltage is drained from all circuits. There are no restrictions on the Trigger input. The driver can be disabled at any time.

4.4 Pulsed Operation

1. Apply power per specification. See power specifications.
2. Enable driver. See Enable signal requirements.
3. Apply trigger pulses. See trigger pulse requirements.
4. Adjust pulse width as desired.

4.5 Setting the Laser Diode Temperature

The industry standard for the thermistor in the diode package is an NTC thermistor with a value of 10k @+25˚C. If your laser has a different value, it will not work correctly with this controller set up (Consult Factory for options).

Even though the nominal value of the thermistor is the same, different manufactures have similar, but not identical curves. If you wish to set the temperature to a value different than 25˚C, a table of resistance vs. temperature will be required for the laser diode in question.

The temperature can also be set using the output wavelength as a basis.

4.5.1 Factory Setting

The factory setting will produce an operating temperature of +25˚C $\pm$ 2˚C for any 10k thermistor.

4.5.2 Adjustment Procedure

For setting by temperature:

Note: It is recommended that this procedure be performed with the driver disabled. Method can be performed with the power turned on or off.

1. Look up desired temperature in the resistance/temperature table. Compute set resistance. $R_{set} = Chart_{res} - 1.5K\Omega$.
2. Turn off the TEC controller.
3. Connect an ohmmeter between TP105 and TP106.
4. Adjust the temperature adjust pot for the desired resistance.
5. Turn on the TEC controller.

For setting by wavelength:

1. Set up whatever test equipment will be required to measure the parameter to be optimized by adjusting the wavelength of the optical output.
2. Connect the optical output to the system and test equipment.
3. Power up the driver.

4. Enable the driver.
5. Input trigger pulses as needed.
6. Make certain the TEC controller is turned on.
7. While monitoring the parameter to be optimized, slowly adjust the temperature adjust pot (See 3.1) to achieve the best response.

4.6 Setting the Pulse Width

1. Set up whatever test equipment will be required to measure the parameter to be optimized by adjusting the pulse width of the optical output.
2. Connect the optical output to the system and test equipment.
3. Power up the driver.
4. Enable the driver.
5. Input trigger pulses at the repetition rate to be used after adjustment.
6. While monitoring the test equipment, adjust the pulse width to the desired value. Clockwise increases pulse width and power. If pulse widths wider than 400 ps are desired, adjusting the rise time pot will increase the maximum width that can be achieved.
7. Some lasers exhibit a fall time tail on the short pulses. This tail, if present, can be reduced with the fall time control. The variable capacitor can also be used as an amplitude control. On wide pulses, the pulse width may also be reduced.
8. There is cross sensitivity between all three controls which varies with the pulse width. For example, the rise time control will mostly affect the pulse amplitude for narrow pulse but has much more effect on the width for wide pulses.

4.7 Repetition Rate

4.7.1 Purpose

The repetition rate will be the same as the trigger rate. However, changes in the repetition rate can have side effects on the pulse characteristics:

1. Full range of the repetition rate is 0 Hz to 1.0 MHz by design.
2. For rep rates up to 300 khz, there is almost no effect on the pulse shape or power.
3. Between 300 kHz and 1.0 MHz, raising the repetition rate will modify the pulse shape. There is special circuitry on board to compensate for this effect. It is not possible to make the compensation perfect due to variable laser contribution and tolerances on certain parts. The compensation is best on short pulses and decreases to no compensation for the maximum width. Wide pulses may also lose width with increasing rep rate.

4.7.2 Dealing with Limitations

As the pulse width is adjusted the voltage at test point 1 changes. Below is a typical graph of the pulse setting's sensitivity to repetition rate. The graph shows a curve of the maximum operating rate which will show less than 10% change in amplitude or pulse width. After setting the pulse characteristics as desired at a repetition rate lower than 300 kHz, TURN OFF the Trigger pulse and measure the voltage at test point 1. If using the external pulse width control, the TP1 voltage will be 2.008 times the input control voltage. Use the graph to determine the maximum operating rep rate to limit pulse changes to less than 10%.

If 10% change with frequency is not sufficient, either set the pulse at any frequency <1MHz and do not change frequency or operate below 300Khz for any TP1 voltage above 7 volts.

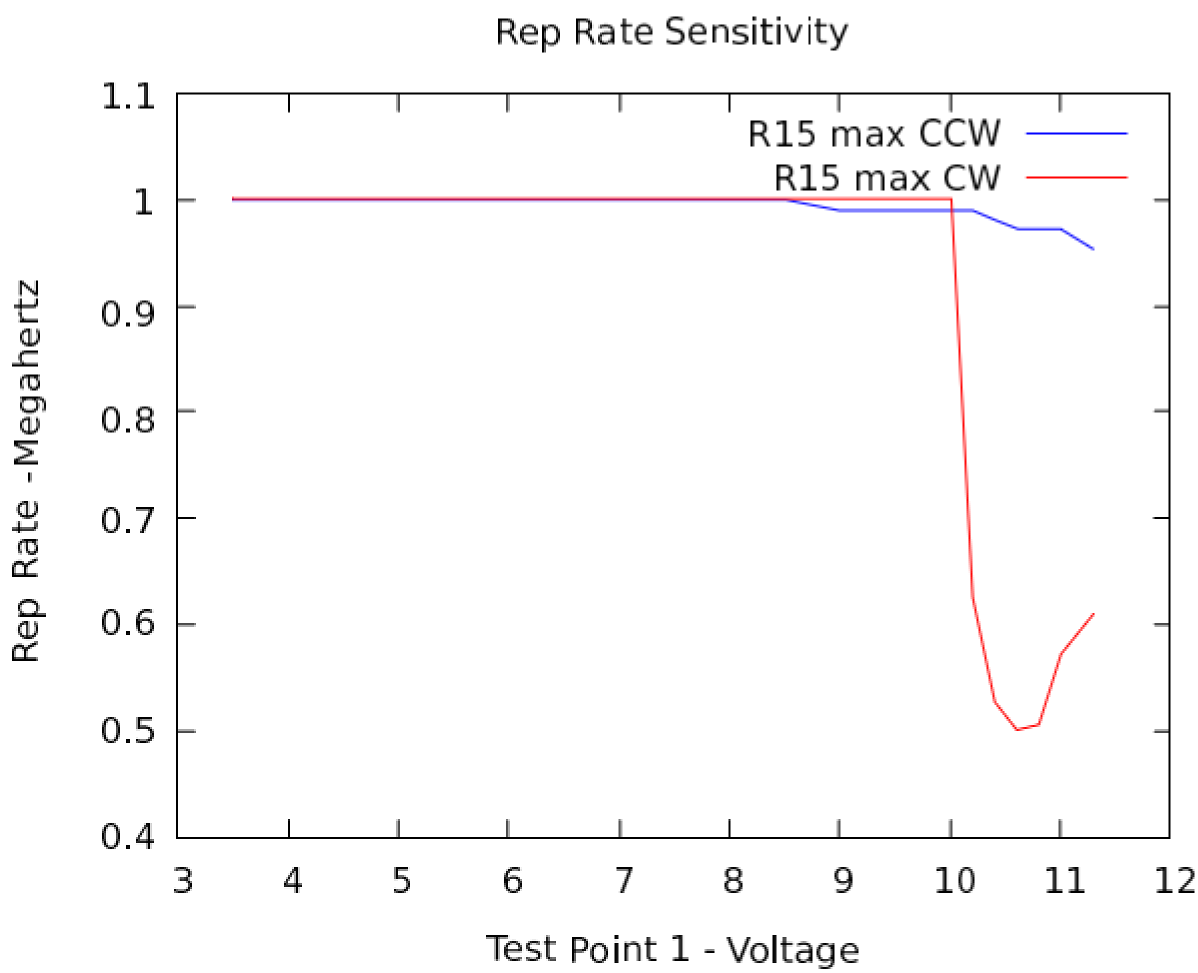

Figure 3 Repetition Rate Limitation

4.8 External Pulse Width Control Use

4.8.1 Need

The control has been included in the interface to allow electrical control of the pulse width from an external low impedance source such as an op-amp or D/A converter. It simply replaces the pulse width control pot with a DC voltage. Over a range of 0 to 6 Volts, it has the same range as min to max on the pot. Since the rise time control is not adjusted automatically, the pulse width range will be a subset of the manual adjustment range. The rise time pot can be preset to alter the range of pulse width control desired. This mechanism should only be used under 2 circumstances.

1. The application requires multiple pulse widths or a continuous setting range.
2. Very tight pulse width control with environmental conditions, or aging requires a closed loop pulse width control.

4.8.2 Use

Set the pulse width control to mid-range. Connect voltage source to the correct input. Vary as needed to produce adjustment range. Adjust rise time control for range adjustment.

4.9 External HV Power Supply Control Use

To use the external HV control, the onboard pot must be adjusted to yield less than full output. At full output the pot is set to 0 and will short the external input. A low impedance voltage source is connected to the input. The range of 0 to .7V will give approx. 155 V down to 0. The effect of reducing the HV is to reduce the output power. Some change to the pulse shape will also occur. In particular, wide pulses will also narrow. The result is very similar to the effect of the fall time control but will not reduce the fall time of lasers which need it.

One possible use of the control is to maintain a constant peak output power when changing the pulse width with the external pulse width control.

4.9.1 Use

Set high voltage adjustment pot to midrange. Connect voltage source to the appropriate pin. Adjust between 0 V (max output) and 0.7 V (0 V output). The principal effect is on amplitude, but lower voltages can also reduce speed.